5.0 HIGH PERFORMANCE BUILDING RATING SYSTEM

5.1 General

A. This section defines a High Performance Building Rating System for Buildings except Low-Rise Residential Buildings.

B. If required by contract, a building shall comply with the Prerequisites (Section 5.5) and Energy Requirements (Section 5.6), and scores with 20 points or more with the Sustainability Credits (Section 5.7).

5.2 Definitions

"Agency" is any state agency, board, commission, department, or division.

"Designer" is the architect(s), engineer(s), and other professionals responsible for the building design.

"Institution" means the University of Utah, Utah State University, Southern Utah University, Weber State University, Snow College, Dixie State College of Utah, College of Eastern Utah, Utah Valley State College, Salt Lake Community College, Utah College of Applied Technology, and any other university or college which may be established and maintained by the state.

"Low-Rise Residential Buildings" means single-family houses, multi-family buildings of three stories or less above grade, and manufactured houses.

"Life-cycle costs" means the sum of the present values of investment costs, capital costs, installation costs, energy costs, operating costs, maintenance costs, and disposal costs, over the lifetime of the project, product, or measure.

"Life-cycle cost-effective" means the life-cycle costs of a product, project, or measure are estimated to be equal to or less than the base case (i.e., current or standard practice or product).

5.3 Referenced Standards and Codes.

The design shall comply with all applicable Standards and Codes at the time submitted to the State Building Official, including but not limited to:

ANSI/ASHRAE Standard 52.2, *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*

ANSI/ASHRAE Standard 55, *Thermal Environmental Conditions for Human Occupancy*

ANSI/ASHRAE Standard 62, *Ventilation for Acceptable Indoor Air Quality.*

ANSI/ASHRAE/IESNA Standard 90.1, *Energy Standard for Buildings Except Low-Rise Residential Buildings*, including Appendix G.

Illuminating Engineering Society of North America, *IESNA Lighting Handbook*.

U.S. Green Building Council, *Leadership in Energy & Environmental Design for New & Major Renovations* (LEED-NC).

5.4 Design and Technology Charrette

A. DFCM may conduct a Design and Technology Charrette with the designers to review the requirements of the standard and strive for an integrated design of energy efficiency and environmental measures. In addition, the charrette shall also consider sustainable site design including:

(1) Natural shade to reduce heat island effect from parking lots and landscaping areas;

(2) Shielded or reduced parking and façade lighting to reduce night sky pollution;

(3) Reuse of existing building to conserve our resources;

(4) Avoiding sewer and waterway contamination;

(5) Use local building materials and products to support local economy and reduce the environmental impacts from transportation;

(6) Encourage the use of public transportation;

(7) Protect wet-lands and green spaces; and

(8) Provide recycling center.

5.5 Prerequisites

A. Fundamental Building Systems Commissioning. DFCM may engage a Commissioning Agent that is not an individual directly responsible for project design or employed by one of the designers. Commissioning Agent shall ensure that fundamental building components are installed and calibrated to operate as intended.

B. Life-Cycle Cost Analysis. Designer shall use life-cycle cost analysis in making decisions about their investments in products, services, construction, and other projects to lower the State Government's costs and to reduce energy and water consumption.

C. CFC Reduction in HVAC and Refrigeration Equipment. Designer shall select HVAC and refrigeration equipment without chlorofluorocarbons (CFC) based refrigerants.

D. Ventilation Systems. Designer shall provide mechanical ventilation system according to Standard 62. Mechanical ventilation system shall have the capability

to operate continuously during occupancy and designed not to be easily shut-down or otherwise defeated, such as blocked registers.

E. Drainage Systems. Designer shall design surface grades, storm drainage system, HVAC system, and other systems to avoid accumulation of standing water around or in the building.

F. Landscape and Irrigation Systems. Designer shall design landscape and irrigation systems according to DFCM Guidelines for Landscape & Irrigation Standard.

G. Fundamental Lighting Design. Designer shall design the lighting system according to IESNA Lighting Handbook.

H. Mold Prevention during Construction. Contractor shall ensure porous type building materials, such as wood, insulation, paper, and fabric, is kept dry to prevent the growth of mold and bacteria. Materials that have been affected by mold shall be abated or replaced. Building insulation that is damp or wet for 72 hours shall be replaced.

I. Filtration Media Replacement before Occupancy. Contractor shall ensure that filtration media is replaced before occupancy.

J. Thermal Comfort. Designer shall ensure that thermal comfort requirements are meet according to Standard 55. Exceptions:

(1) Winter humidification is not required;

(2) Summer dehumidification is not required; and

(3) Upper temperature limit in natural ventilated buildings is not required.

5.6 Energy Efficiency Requirements:

A. Energy Performance. DFCM may select an integrated system of components to reduce source energy use what is required by Standard 90.1.

(1) DFCM shall engage an Energy Specialist with 3 years of experience with hourly energy modeling. Energy Specialist is not an individual directly responsible for project design or employed by one of the designers. Energy specialist shall perform the energy analysis according to Appendix G of Standard 90.1. Energy Specialist shall prepare report according to DFCM template and shall specify which energy efficiency measure should be commissioned. Energy Specialist shall consider reducing energy use in each major categories: 1) lighting, 2) cooling, 3) heating, 4) pumps/cooling tower, 5) internal loads, and 6) external loads. Energy specialist should also consider the following technologies:

a. Daylighting;

b. Natural ventilation;

c. Evaporative cooling;

d. Demand-controlled ventilation using CO2 or occupancy sensors;

e. Green roof;

f. Ground source heat pumps;

g. Spectrally selective glazings;

h. Underfloor air distribution;

i. Radiant cold beam system; and

j. Displacement ventilation system.

(2) Commissioning Agent shall ensure the selected energy efficiency measures are installed and calibrated to operate as intended.

B. Small Buildings Prescriptive Energy (Optional). For nonresidential buildings with 3 floors or less and 75,000 square feet or less, Designer may substantially design the Building Envelope, Lighting System, HVAC system, and Service Water Heating system according to the recommended performance levels shown in Tables 1 through 4 in compliance with Standard 90.1.

Table 1 – Small Buildings Prescription Energy Option: Building Envelope[4]

Category	Component	Recommendation
Roof	Insulation entirely above deck	R-20 continuous insulation and Energy-Star® rated surface
	Metal building	R-13 + R-19
	Attic and other	R-38
	Single rafter (insulated flat or vaulted ceilings)	R-38 + R-5 continuous insulation
Walls	Mass (HC > 7 Btu/ft2) [1]	R-11.4 continuous insulation
	Metal building	R-13+R-13
	Steel framed	R-13+ R-7.5 continuous insulation
	Wood frame and other	R-13 + R-3.8 continuous insulation
	Below-grade walls	R-7.5 continuous insulation
Floors	Mass	R-10.4 continuous insulation
	Steel framed:	R-30
	Wood framed and other	R-30
Slab	Unheated	None[2]
	Heated	R-10 for 36 in.
Doors	Swinging	U-0.70
	Non-swinging	U-0.50
Vertical Glazing	Window-to-wall ratio (WWR)	40% maximum
	Overall thermal transmittance	U-0.42
	Shading Coefficient	SC-0.40[3]
	Exterior sun control (S, E, W only)	Projection Factor-0.5 [5]
	Low-e coating	Emittance < 0.05
Orientation	$(A_{north} * SC_{north} + A_{south} * SC_{south}) > (A_{east} * SC_{east} + A_{west} * SC_{west})$	Area (A) and Shading Coefficient (SC) of the Window
Skylight	Percent of roof area	3% maximum
	Overall thermal transmittance	U-0.69
	Overall solar heat gain coefficient	SC-0.42

[1] Fully grouted CMU walls or 6 inch concrete walls qualify for a mass wall.

[2] R-10 for 24 in. located in counties of Box Elder, Cache, Carbon, Daggett, Duchesne, Morgan, Rich, Summit, Uintah, and Wasatch.
[3] SC-0.44 for glazing located on the street side of the street level with continuous overhang with projection factor of 0.5 (S, E, W only).
[4] Reference documents: ASHRAE *Advanced Energy Design Guide for Small Office Buildings* and Standard 90.1.
[5] Projection Factor = (Horizontal Projection) / (Height Above Sill)

Table 2 – Small Buildings Prescription Energy Option: Lighting

Category	Component	Recommendation
Interior Lighting	Lighting power density (LPD)	10% Savings over Standard 90.1
	Premium T8 lamps	≥ 3100 Lumens
	Premium T8 ballasts	BF ≤ 0.8
	Window daylighting controls	Dim within 12 ft of windows
	Skylight daylighting controls	Dim within 8 ft of skylight
	Occupancy sensors	Auto-off in non-24 hour rooms
	Ceiling reflectance	80%
	Wall and partitions reflectance	70%
	High or low bay lighting	High or low bay T5[1] fixtures

[1] In semi-heated or unheated spaces, use pulse start metal halide.

Table 3 – Small Buildings Prescription Energy Option: HVAC

Category	Component	Recommendation
HVAC	Air Conditioner (< 65,000 Btu/hr)	15 SEER
	Air Conditioner (≥ 65,000 Btu/hr and < 135,000 Btu/hr)	11.0 EER and 11.4 IPLV
	Air Conditioner (≥ 135,000 Btu/hr and < 240,000 Btu/hr)	10.8 EER and 11.2 IPLV
	Air Conditioner (> 240,000 Btu/hr)	10.0 EER and 10.4 IPLV
	Air Conditioner Water or Evaporatively Cooled	14.0 EER
	Heat Pumps (< 65,000 Btu/hr)	13 SEER (Cooling) 8.0 HSPF (Heating, Split System) 7.5 HSPF (Heating, Single System)
	Heat Pumps (≥ 65,000 Btu/hr and < 135,000 Btu/hr)	11.0 EER and 11.4 IPLV (Cooling) 3.4 COP (Heating, 47° OSA) 2.4 COP (Heating, 17° OSA)
	Heat Pumps (≥ 135,000 Btu/hr and < 240,000 Btu/hr)	10.8 EER and 11.2 IPLV
	Heat Pumps (> 240,000 Btu/hr)	10.0 EER and 10.4 IPLV
	Air Conditioner Water or Evaporative Cooled	14.0 EER
	Water-source heat pump	14.0 EER (Cooling) 4.6 COP (Heating)
	Semi-cooled spaces	Direct or Indirect Evaporative Cooling (< 25,000 cfm)
	Gas furnace (≤ 225,000 Btu)	80% AFUE or Et (Single Package AC) 90% AFUE or Et (Split AC)
	Gas furnace (> 225,000 Btu)	80% Ec
Boiler	Hot Water Boiler (≤ 300,000 Btu)	90% AFUE
Motors	All pump and fan motors (≥ 1 hp)	NEMA Premium Efficiency Motors
Economizer	Air conditioners and heat pumps (single package)	Cooling capacity > 54,000 Btu
Ventilation	Outdoor air dampers	Motorized control
Duct	Friction rate	0.08 in. w.c. per 100 feet
	Sealing	Sealing class B
	Insulation level	R-6

Table 4 – Small Buildings Prescription Energy Option: Service Water Heating

Category	Component	Recommendation
Service Water Heating	Gas storage	90% Et
	Gas instantaneous	0.81 EF or 81% Et
	Electric storage 12 kW	EF > 0.99 – 0.0012 x Volume
	Pipe insulation	1 in. (diameter < 1.5 in.) 1.5 in. (diameter > 1.5 in.)

5.7 Sustainability Credits

A. Daylighting Credits

(1) Daylighting. Designer shall use daylight as the primary lighting system for 40 to 90 percent of the space, excluding copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas. Daylight zones shall have a minimum Daylight Factor of 2 percent and a maximum illumination of 200 footcandles. "Daylight Factor" means the ratio of interior to exterior illumination. Design shall lower peak and annual cooling loads compared to a building meeting Standard 90.1.

a. The Commissioning Agent shall ensure the daylighting control system is installed and calibrated to operate as intended.

2 points Daylighting in 40 percent of the space.
3 points Daylighting in 52 percent of the space.
4 points Daylighting in 62 percent of the space.
5 points Daylighting in 74 percent of the space.
6 points Daylighting in 90 percent of the space.

B. Energy Credits

(1) Evaporative Cooling. Designer shall select the evaporative cooling system to reduce mechanical cooling by 15 percent based on calculation method of Appendix G, Standard 90.1. Design the HVAC controls to turn off the evaporative cooling system whenever the indoor humidity level exceeds 60 percent. It should be integrated with the air economizer system and mechanical cooling system:

a. The Commissioning Agent shall ensure the evaporative cooling system is installed and calibrated to operate as intended.

2 points Evaporative cooling system.

(2) Demand-Controlled Ventilation using CO2 Sensors. Designer shall select the ventilation system to have a means to automatically reduce outside air intake using CO2 Sensors according to Standard 62.

a. The Commissioning Agent shall ensure the Demand-Controlled Ventilation system is installed and calibrated to operate as intended.

1 points Demand-controlled ventilation system.

(3) Underfloor Air Distribution. Designer shall provide an underfloor air distribution system with ceiling return or equivalent air displacement system, excluding copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas.

2 points Underfloor air distribution system.

C. Renewable Energy Credits

(1) Renewable Energy. Designer shall select on-site renewable energy such as photovoltaic, wind, geothermal, and fuel cells utilizing biogas to reduce source energy use.

2 point	5 percent reduction in source energy use.
3 points	12 percent reduction in source energy use.
4 points	22 percent reduction in source energy use.
5 points	34 percent reduction in source energy use.
6 points	50 percent reduction in source energy use.

D. Indoor Air Quality Credits

(1) Low-Emitting Materials. Designer shall select adhesives and sealants, paints and coatings, carpet, and composite woods with low-emitting materials.

1 point	Select adhesives and sealants that meet USGBC LEED™ - NC, Credit 4.1, requirements.
1 point	Select paints and coatings that meet USGBC LEED™ - NC, Credit 4.2, requirements.
1 point	Select carpets that meet USGBC LEED™ - NC, Credit 4.3, requirements.
1 point	Select composite woods that meet USGBC LEED™ - NC, Credit 4.4, requirements.

(2) Pollutant Source Control. Designer shall design the HVAC system to vent pollution sources, minimize cross-contamination of chemical pollutants, avoid dust and microbial growth, and install rated filtration media.

1 point	Install source ventilation system to vent pollution sources such as copy rooms, chemical storage rooms, janitorial rooms, food preparation spaces, and other polluting activities. Install separation walls that extend to the structure to prevent cross-contamination.
1 point	Design HVAC system to avoid areas where mold and dust can accumulate, such as return plenums and fibrous ductwork.
1 point	Select MERV rated filters of 11 or greater according to Standard 52.2.

(3) Construction Indoor Air Quality Management Plan. Contractor shall ensure that Volatile Organic Compounds (VOC), dust, oils, and odors have been contained and removed before occupancy.

a. Prior to installation of materials and products that emits VOC or odors, allow materials and products to off-gas in a well ventilated staging area. Remove any oil films and dust.

b. During installation of materials and products that emits VOC or odors, use HVAC fans, open windows, or temporary fans to continuously ventilate the area until emissions dissipate, and protect porous materials with polyethylene vapor retarders.

c. During dust producing activities (such as drywall installation and finishing), protect HVAC fans and ductwork from accumulating dust by turning off the fans and cover air grilles, registers, and other duct openings. Use temporary fans to ventilate the space.

d. Prior to operating HVAC system, vacuum dust that has accumulated in HVAC fans, plenums, and ductwork with HEPA vacuum and remove any oil films from metal surfaces.

e. Prior to substantial completion, vacuum carpet and other soft surface with HEPA vacuum.

1 point	Construction Indoor Air Quality Management Plan
1 point	Prior to occupancy and after Substantial Completion, flush building for 15 days with 100 percent outside air.

E. Commissioning and Training Credits

(1) Additional Commissioning. Commissioning Agent shall ensure the building is designed, constructed, and calibrated to operate as intended. Implement the following additional commissioning tasks beyond the Prerequisites Fundamental Commissioning requirements:

a. Review and provide recommendations on the design document prior to issuing the construction documents.

b. Review the contractor submittals relative to the systems being commissioned.

c. Develop Recommissioning Plan to schedule commissioning activities to assure the building is continuously tuned to optimize performance.

2 points	Additional commissioning.

F. Acoustics Credits

(1) Improve Acoustical Performance. Designer shall design work spaces to provide acoustic levels that limit excess noise from exterior sources, HVAC systems, and other sources.

1 point	Acoustical level of 36 to 40 dBA background, and 0.6 second reverberating times or less.
2 points	Acoustical level of 35 dBA background or less, and 0.6 second reverberating times or less.

G. Sustainable Material Credits

(1) Recycled Content. Designer shall select building products that have incorporated recycled-content in major materials from the Construction Products category of the US Environmental Protection Agency (EPA) Comprehensive Procurement Guidelines. Major materials include parking areas, floor, roof, partition, walls, or serving a structural function throughout the building.

1 point	Four to seven major materials with recycled-content.
2 points	Eight or more major materials with recycled-content.

H. Waste Reduction Credits

(1) Site Waste Reduction. Contractor shall ensure that construction waste, demolition, and land clearing waste are recycled, composted, and salvaged. “Recycle Rate” is the ratio of recycled waste (by weight) to total waste (by weight).

1 point	Recycle Rate of 50 to 74 percent.
2 points	Recycle Rate of 75 percent or greater.

I. Water Reduction Credits

(1) Water Efficient Fixtures and Appliances. Designer shall select water-efficient, fixtures and appliances with maximum flow shown below:

a. Sensor faucet, 0.5 gpm

b. Showerhead, 1.5 gpm

c. Sensored flushometer toilet, 1.1-1.3 gpf, or dual flush valve

d. Waterless or ultra-low flow urinal, 0.5 lpf

2 points Water efficient fixtures and appliances.

J. Performance Measurement and Verification Credits

(1) Building Performance Monitoring on Multi-Building Campus. On a multi-building campus, agencies and institutions shall meter each energy type for each building. Energy type includes electricity, natural gas, central chilled

water, central heating water, and central steam. The energy management system shall the capability to monitor and log sub-metering energy use and electrical demand. Provide sub-meter water use on landscaping and other irrigation strategies.

1 point Building performance monitoring on multi-building campus.

(2) System Performance Monitoring. Designer shall provide continuous metering equipment for the following equipment performance shall the capability to monitor and log equipment performance:

a. Lighting system (kWh and kW)

b. Motor loads >20 hp (kWh and kW)

c. Variable speed drive operation

d. Chiller efficiency or chiller plant efficiency (i.e. chiller, cooling tower and pumps)

e. Air and water economizer operation

f. On variable volume system, supply air static pressure and volume

g. Boiler efficiency or boiler plant efficiency (i.e. boiler and pumps)

h. Process loads (kWh and kW)

1 point System performance monitoring.

K. Innovation in Design

(1) The Director of DFCM, based on justified recommendations by the Energy Manager, may award up to 4 additional points for exceptional energy or environmental measures not specifically address in the rating system.

1 to 4 points Exceptional energy or environmental measures.

5.8 Submittals

A. DFCM shall establish letter templates to document compliance with the High Performance Building Rating System used by the designers, contractors, agencies, institutions, commissioning agents, and energy specialists.